PTO 04-2567

Japanese Kokai
Sho 59-162853(A)

(7)

METHOD OF PRODUCING MARBLED MEAT

[Shimofurijō Shokuniku no Seizō Hōhō]

Kyōji ITŌ et al.

UNITED STATES PATENT AND TRADEMARK OFFICE

Washington, D.C. April, 2004

Translated by: Schreiber Translations, Inc.

Country	:	Japan
Document No.	:	Shō 59-162853(A)
Document Type	:	Kokai
Language	:	Japanese
Inventor	:	Kyōji ITŌ, Toyorō NAKAMURA, Masahiro NUMATA, Akiko ŌGUCHI
Applicant	:	Itō Ham K.K.
IPC	:	A23L 1/31
Application Date	:	March 8, 1983
Publication Date	:	September 13, 1984
Foreign Language Title	:	Shimofurijō Shokuniku no Seizō Hōhō
English Title	:	METHOD OF PRODUCING MARBLED MEAT

/1[1]

Specification

1. Title

METHOD OF PROUDCING MARBLED MEAT

2. Claims

(1) A method of producing marbled meat characterized by comprising the steps of:

emulsifying fat, protein, and water at a temperature higher than the solidifying temperature of the fat and lower than the denaturing temperature of the protein to obtain an emulsion, and

while maintaining the emulsion within this temperature range, injecting said emulsion into meat.

(2) The method of claim (1) wherein said meat is selected from among the group consisting of domestic animal meat, domestic fowl meat, and domestic rabbit meat.

(3) The method of claim (1) wherein said fat is selected from among the group consisting of animal fats such as beef tallow, lard, butter, and margarine, and vegetable fats.

(4) The method of claim (1) wherein said protein is albumin.

---

[1] Numbers in the margin indicate pagination in the foreign text.

(5) The method of claim (1) wherein said emulsion is prepared from 40 to 60 parts of fat, one part of protein, and 30 to 60 parts of water.

3. Detailed Description of the Invention

The present invention relates to a method of marbling meat.

Marbled meat consists of a white reticulate layer of fat present in red meat such as beef and pork. When heated during cooking, the fat melts out in suitable quantity, imparting a unique aroma to the meat and creating a pleasant sensation of juiciness. This flavor and sensation have imparted a high-class image to marbled meat and caused it to be accepted by consumers. Cuts of meat with little fat, such as the shoulder and thigh, do not have this property and impart a harsh culinary sensation. Thus, they are considered to be inferior to marbled meat and are less expensive. For this reason, research and development has been conducted into how to make high-class marbled meat out of relatively inexpensive meat with little fat to increase the value added.

A number of methods have been attempted, such as methods of extrusion molding lean meat and fat through separate nozzles (Japanese Patent Application Publication Nos. Shō 55-48370 and Shō 57-166967), the method of mixing and molding an emulsion resembling fat with small pieces of meat or other protein

materials (Japanese Patent Application Publication No. Shō 55-64763), the method of injecting cream-like beef tallow directly into the starting material (Japanese Patent Application Publication No. Shō 56-29948), and methods of injecting butter into chicken (Japanese Patent Application Publication Nos. Shō 50-31059 and Shō 50-31060).

However, the marbled meat produced by the above-cited prior art methods is inferior to natural marbled meat in terms of the marbled state, the texture of the meat, chewiness, the melting out of fat during cooking, external appearance, and the like. For example, marbled meat products obtained by prior art methods have the fatal drawback of high cooking losses (reduction in weight during cooking) due to melting out of nearly all of the fat and emulsion that has been injected when preparing steak or yakiniku. Further, combination methods in which strongly gelled emulsions and small pieces of meat are joined together to effect improvement in this regard are unsatisfactory in terms of appearance and chewiness.

Accordingly, the object of the present invention is to provide marbled meat that is essentially identical to natural marbled meat, affording good suitability to cooking, good

flavor, and good mouth feel by adding fat to relatively lean meat or portions of meat.

The present inventors conducted extensive research into achieving the above-stated goal, resulting in the discovery that by emulsifying a mixture consisting of fat, protein, and water at a prescribed temperature to obtain an emulsion and injecting the emulsion into meat while maintaining the emulsion at the prescribed temperature, it was possible to obtain marbled meat with good suitability to cooking, flavor, and mouth feel; the present invention was devised on this basis.

That is, the present invention is a method of producing marbled meat characterized by comprising the steps of emulsifying fat, protein, and water at a temperature higher than the solidifying temperature of the fat and lower than the denaturing temperature of the protein to obtain an emulsion, and while maintaining the emulsion within this temperature range, injecting the emulsion into meat.

In the present invention, the meat into which the emulsion is injected may be beef, pork, fowl, mutton, goat meat, the meat of other domesticated animals, chicken, turkey, goose, duck, the meat of other domesticated fowl, domesticated rabbit, or some other meat. The meat employed has at least one portion that is relatively lean.

The fat employed in the present invention is not specifically limited other than that it simultaneously possess the properties of enhancing the flavor of the meat into which it is injected and being liquid at a certain temperature range lower than the denaturing temperature of the protein employed for its solidifying strength at low temperature range. Specifically, fat obtained from the above-listed meats, that is, animal and plants fats such as beef tallow, lard, butter, and margarine, may be employed. Vegetable fats that do not solidify at low temperatures may be employed by treating them with gelling agents such as gums, agar, and gelatins to impart low-temperature gelling properties. The quality of the flavor of a fat is generally greatly affected by freshness. There are measurement methods, such as determining the acid value and peroxide value, that can be used to determine freshness. The value varies with the type of animal, purification method, degree of purification, and the like. In the case of beef tallow, a peroxide value of no greater than 4.7 meq/kg is desirable.

Unprocessed fat that has not been subjected to a purification process is desirably melted and the insoluble matter removed prior to use. In that case, it melts better when chopped to suitable size, or processed in a cutter, dicing

machine, or the like prior to heating. Insoluble matter can be readily filtered out with suitable meshlike cloth or gauze. The melting property and suitability to processing of the fat differs with the type and part of the animal. When employing a fat, it suffices to select one that is suited to the above-stated process. In the case of beef tallow, fatty portions around internal organs are suitable.

The protein employed in the present invention functions as an emulsifying agent to emulsify the fat and water. This protein keeps the emulsion containing fat, protein, and water stable at a temperature higher than the solidifying temperature of the fat and lower than the denaturing temperature of the protein. In the course of cooking meat that has been injected with emulsion, a portion of the protein can melt out while a suitable portion of the protein remains in the meat after heating. That is, heating denatures and solidifies the protein, with a portion of the injected protein melting out, but a portion also remains within the meat, imparting the desirable flavor of fat and a pleasant sensation of juiciness to the cooked meat. When almost none of the injected emulsion melts out due to heating during cooking, but ends up solidifying, with

/3

solidified emulsion remaining as is in meat that has turned brown from the heat, an undesirable external appearance results and juiciness is compromised. Accordingly, the protein employed in the emulsion of the present invention is selected so that a suitable portion is retained as set forth above. Specific examples of such proteins are albumin, casein, other animal proteins, soy protein, wheat protein, peanut protein, and other vegetable proteins. Albumin is preferred from the perspectives of flavor and mouth feel following cooking of the injected meat.

In the present invention, the ratio of fat, protein, and water in the emulsion and the quantity of emulsion injected are suitably determined by taking into account the amount of fat and toughness of the meat into which the emulsion is being injected. The ratio of fat in the emulsion is, in the case of beef tallow, for example, generally from 40 to 60 weight percent, preferably 45 to 55 weight percent. When the ratio of fat exceeds this level, the stability of the emulsion deteriorates, fluidity during injection decreases, and injection becomes difficult. There is also a risk of pieces of fat forming in the meat. When the ratio of fat is lower than the stated level, the solidification power at lower temperature decreases, the fat flows out of the meat, and problems are created in subsequent operation steps such as slicing. The ratio of protein in the

emulsion, in the example of albumin, is suitably about from 0.5 to 1.5 weight percent.

The emulsion is prepared in an ordinary emulsifying device at a temperature higher than the solidifying temperature of the fat and lower than the denaturing temperature of the protein. When albumin is employed as protein and beef tallow is emulsified, the emulsion is normally desirably prepared within a temperature range of 50 to 60°C. Normally, an emulsification time of from about three to five minutes is adequate.

The emulsion obtained in this manner is injected into meat while being maintained within the above-stated temperature range, normally at the temperature at which the emulsion has been prepared. Any injection device may be employed in injection. However, it is necessary for the temperature to be consistently maintained from the emulsion tank to the injection needle. When the temperature drops below the solidifying temperature of the fat during injection, dispersion in the meat deteriorates and a marbled appearance is precluded. When the temperature exceeds the denaturing temperature of the protein, the meat in the area of injection generally discolors, imparting an undesirable burned look to the meat.

The quantity of emulsion injected is suitably determined to achieve the desired degree of marbling (marbling score). The

usual practice is to inject 10 to 30 percent of the weight of the meat.

This varies with the toughness of the starting material meat, how long it has aged, where it was produced, how it has been handled, and cut of the meat. Thus, when needed, protein cleaving enzymes such as papain, bromelin, and ficin may be added to the emulsion to further tenderize the meat. These enzymes are desirably added in a quantity that is predetermined to be suitable to the properties of the starting material meat. The starting material meat may also be placed in a tenderizing unit and mechanically tenderized before or after the addition of the emulsion.

Emulsifying agents such as lecithin and amino acid monoglyceride may be supplementarily added to the above emulsion. Or, to further enhance the flavor of the meat, natural meat extract, amino acid extract, and other seasonings and flavorings may be added.

To prevent the temperature of the meat from becoming excessively high, the meat that has been injected with the emulsion is desirably frozen immediately after injection.

When employed as a starting material meat for processing, provided there is no cooking step, once the meat has been chilled, preferably refrigerated at 5°C or below, it can be

subjected to the usual processing methods. In that case, to prevent excessive tenderizing of the meat, it is better not to employ protein-cleaving enzymes.

The marbled meat obtained by the above-described method of the present invention is identical in appearance to naturally marbled meat, is suited to cooking, and affords substantially enhanced flavor over the starting material meat. When meat that has been marbled by the method of the present invention is cooked, only a portion of the injected fat melts out, with the remainder remaining in the meat, yielding cooked meat with a juicy sensation and the same rich flavor as naturally marbled meat.

The present invention is described in greater detail below through embodiments.

Embodiment 1 /4

A 10 kg quantity of the fatty portion around the organs of a cow (peroxide value of 2.5 meq/kg) was chopped with a plate having a center hole diameter of 3.2 mm and melted by heating. The impurities were then removed with gauze, yielding 8.1 kg of purified beef tallow. An emulsion comprised of 55 parts of this purified tallow, 40 parts of water, 1.2 parts of albumin, 3.8 parts of seasoning (2.5 parts of meat extract and 1.3 parts of amino acid extract), and 150 ppm of papain for tenderizing was

prepared at 55°C and immediately transferred to an injector equipped to maintain a temperature of 50 to 60°C.

Next, 10, 15, and 20 percent quantities of emulsion based on weight were injected into discarded shoulder roast (with a marbling score of +1) produced in Japan. The roast was molded into sirloin for each test segment. Once frozen, it was sliced into steaks 1.2 cm in thickness.

The final food product was cooked on a steak grill (seven minutes on the front side and four minutes on the back side at 205°C) and provided to a nine-member panel for analysis of mouth feel and flavor. The various test segments (10 percent injection segment: Embodiment 1-1; 15 percent injection segment: Embodiment 1-2; 20 percent injection segment: Embodiment 1-3) were compared to the unprocessed meat (Comparative Example 1) and scored on the following 5-level scale; the results are given in Table 1.

+2	Much better than unprocessed meat
+1	Somewhat better than unprocessed meat
0	About the same as unprocessed meat
-1	Somewhat worse than unprocessed meat
-2	Much worse than unprocessed meat

The results in Table 1 show that the product of the present invention afforded both better mouth feel and flavor. This

effect was particularly marked when the amount of emulsion injected was 15 percent or more. In the 20 percent injection segment, it lacked nothing over good quality naturally marbled roast meat.

Table 1: Results of testing of domestically produced roast meat

	External appearance	Marbling score	Crude fat in lean meat	State during cooking	Cooking yield*	Organoleptic test score	
						mouth feel	flavor
Unprocessed	Slight stringiness in spots in center	+1	4.2%	No fat melted out.	86.13%	0	0
Segment injected with 10% emulsion	Normal stringiness	+2	8.9%	A little fat melted out	82.85%	+0.4	+0.6
Segment injected with 15% emulsion	Fine strings were present throughout, from center portion to muscle	+2 to +3	10.4%	Cooked like naturally marbled meat	81.41%	+1.2	+1.4
Segment injected with 20% emulsion	There were numerous strings uniformly present. The overall color of the meat was lighter due to the contrast with the fat	+4	13.1%	Cooked like naturally marbled meat	79.08%	+1.7	+1.8

*Cooking yield = (Cooked weight/uncooked weight) x 100 (%) /5

Embodiment 2

To tenderize 3.5 kg of naka meat (marbling score of +2), the thigh meat of cattle raised in Japan, the meat was passed through a tenderizing unit and divided into three parts. The emulsion of Embodiment 1 with the amount of papain added having been changed to 180 ppm was injected into the 1.3 kg of the first segment, yielding 1.6 kg of naka meat after injection

(Embodiment 2). For comparison, nothing was injected into the second segment (Comparative Example 2-1). Instead of the emulsion of the above embodiment, only purified beef tallow was injected by the same method into the 1.2 kg of the third segment, yielding 1.45 kg of naka meat (Comparative Example 2-2).

The meats of these three segments were molded into sirloin and frozen in the same manner as in Embodiment 1, with one portion being sliced into 1.2 cm steaks and the remainder being sliced to 2 mm for preparing yakiniku.

The final products were cooked under the conditions given below and organoleptically tested in the same manner as in Embodiment 1. The results are given in Table 2.

Table 2: Results of testing of domestically produced naka meat

	Marbling score	Crude fat in lean	Steak			Yakiniku		
			Cooking yield	Organoleptic test scores		Cooking yield	Organoleptic test scores	
				Mouthfeel	Flavor		Mouthfeel	Flavor
Unprocessed	+2	7.5%	78.63%	0	0	69.58%	0	0
Segment injected with purified beef tallow	+5	22.0%	64.13%	+0.3	+0.8	54.58%	+0.2	+0.3
Emulsion injected with emulsion	+5	17.3%	70.50%	+1.6	+1.7	60.82%	+1.3	+1.8

Cooking conditions:

Steak: Seven minutes on one side and four minutes on the other on a 205°C steak grill.

Yakiniku: Three minutes on one side and one minute on the other on a 205°C steak grill. /6

Table 2 shows that in the product into which just beef tallow was injected, nearly all of the injected fat was melted out by the heat during cooking, so no effect was produced. By contrast, in the product of the present invention, marked improvements in mouthfeel, flavor, and suitability to cooking were found.

Embodiment 3

A 4.1 kg quantity of purified beef tallow was obtained by the same operation as in Embodiment 1 from 5 kg of the fatty portion (peroxide value of 1.7 meq/kg) around the organs of a cow. An emulsion consisting of 52.5 parts of this purified tallow, 42.5 parts of water, 1.2 parts of albumin, and 3.8 parts of seasoning (1.5 parts of meat extract, 1 part of amino acid extract, and 1.3 parts of flavoring materials) was prepared at 55°C. The above injection unit was employed to inject 20 percent by weight of this emulsion into topside (marbling score 0), a type of imported thigh meat, that had been maintained at 5°C after thawing overnight.

The above processed meat and unprocessed meat were employed as starting materials for roast beef. After molding, they were flavored with 1.5 percent table salt and 0.6 percent seasoning.

In the cooking step, they were cooked in two stages (temperature at center 65°C): 20 min at 200°C and 30 min at 150°C. When this had been completed, they were refrigerated overnight at +2°C in a refrigerator.

Organoleptic testing was conducted in the same manner as in Embodiment 1; the results are given in Table 3.

Table 3: Roast beef test results

	Crude fat in lean meat	Cooking yield*	Organoleptic test score	
			Mouthfeel	Flavor
Unprocessed	1.3%	78.56%	0	0
Segment injected with 20% emulsion	10.8%	74.83%	+1.4	+1.6

* Cooking yield: (Cooked weight/uncooked weight) x 100 (%)

Based on the results of Table 3, the roast beef of the present invention had the particular flavor of beef tallow, was savory, and had good mouthfeel, affording significant results relative to unprocessed meat.